Editorial

Introduction to the Special Section on Emerging Technologies for Connected Vehicles and ITS Networks

Introduction

Over the past decade, advances in vehicular communications and intelligent transportation systems (ITS) have intended to trim down the fuel expenditure by reducing traffic congestion, and enhancing traffic safety, while initiating new applications like mobile infotainment. To address the individual requirements of both safety and non-safety applications in the Connected Vehicles, there is a need to build up a new communication technology for the integrated solutions of vehicular communication and ITS. The Connected Vehicles can be of various models, such as Vehicle-to-Vehicle (V2V), Vehicle-to-Infrastructure (V2I), and Vehicle-to-Everything (V2E). Due to the rapid growth in this area, many constraints need to be addressed, e. g., reliability and latency, appropriate scalable design of MAC and routing protocols, performance and adaptability to the changes in environment (node density and oscillation in network topology), and evaluation and validation of Connected Vehicles' protocols under the umbrella of coherent assumptions using simulation methodologies.

This special section aims to focus on the latest achievements to identify those aspects of Connected Vehicles and ITS networks that are identical to traditional communication networks in the broader spectrum.

Papers in this Special Section

To complement the well known approaches including the probability theory and fuzzy technique that are not adequate for many transportation situation such as the multi-objective transportation (MO-TP), Rizk et al. in the article entitled "A multi-objective transportation model under neutrosophic environment" propose a new neutrosophic compromise programming approach (NCPA) that can efficiently deal with MO-TP. The proposed technique maximize the degrees of satisfaction and dissatisfaction and minimize the degree of indeterminacy of a neutrosophic decision. The performance of the NCPA technique is investigated using TOPSIS approach with better results compared to existing techniques.

Zeeshan et al. in the article entitled "Infrastructure-assisted joint power adaptation and routing for heterogeneous vehicular networks" propose a separation of the wireless channel for data and control message transmission to improve channel capacity and time consumption. Based on a multi-tiered, heterogeneous vehicular network architecture, their protocol allocates offloading control messages over the cellular network and data over the ad hoc network. Furthermore, the authors propose a broadcast algorithm that helps in decision making by predicting connectivity information for each vehicle. Additionally, a broadcast algorithm is proposed to exploit predicted connectivity information that helps to decide on transmit power levels for each vehicle. The implementation of the proposed techniques outperform the conventional routing protocols such as AODV, GPRS, and MGRP in terms of packet delivery ratio, end to end delay and message overhead.

Recently, the concept of using mobile gateways compared to fixed infrastructures for the Vehicular ad-hoc networks has attracted both academia and industry groups. In the article entitled "A multi-objective optimization system for mobile gateways selection in vehicular Ad-Hoc networks", Sara et al. use Integer Optimization and Constraint Optimization models as a multi-objective optimization system for mobile gateways selection. The proposed technique offers a suitable selection of appropriate gateways for vehicle users. The evaluation of the proposed techniques compared to the existing literature review are promising.

The fifth article "Modeling and analysis of LTE connectivity in a high mobility vehicular environment" by Burbano et al. present a study that shows the behavior of the downlink channel quality of the Long Term Evaluation (LTE). The authors used a Markov-chain based model to represent how the channel quality indicator changes from one point to another by

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analyzing a considerable number of measurements of LTE signals. The reference signal was collected through a crowdsourcing application on a motorway where every user that downloaded and used the application was labeled as a sensor node. The article also provides a discussion of the various potential application of the proposed model.

The concept of Social Internet of Things (SIoT) extends the IoT paradigm with the idea to stimulate the IoT device consciousness. The SIoT aims at helping the IoT devices to socialize with each other based on shared context and mutual interests. The sixth article entitled “Social Internet of Vehicles: Architecture and enabling technologies”, Talal et al. introduce the Social Internet of Vehicles (SIoV) framework using the SIoT concepts for the Intelligent Transportation System (ITS). The proposed architecture is based on Restful web technology in order to provide interoperability with diverse services. The composing entities of SIoV architecture are illustrated with their functions and enabling technologies and protocols. The feasibility of the proposed architecture is shown through a number of use cases.

The article entitled “A Traffic-Aware Segment-based Routing protocol for VANETs in urban scenarios” by Saifullah et al. proposed proposes a new routing protocol called Traffic Aware Segment-based Routing (TASR) protocol that improves the safety of urban applications in VANETs. The authors propose a novel metric called Estimated Connectivity Degree (ECD) for real-time route selection. Furthermore, the authors propose a new forwarding technique that use geographical information to send packets from source to destination. The TASR and ECD protocols are evaluated through extensive simulations and compared to competing routing protocols.

To contribute to the crucial issue of timely assistance of accident scenes using intelligent transportations systems, the eighth article entitled “Experimental validation of an accident detection and management application in vehicular environment” by Kishwer et al. propose an application that used embedded sensors with the vehicles to detect the accidents and generate alarm messages to medical services. The application was tested both in an IoT based and VANETs based scenarios. The application generates an alert/emergency messages in rescue vehicles such as ambulance which is used to clear the route to the accident location. The evaluation of the application shows that a better performance in terms of false alarm avoidance.

The article entitled “Cooperative mobile edge computing system for VANET-based software-defined content delivery” by Jafar et al. propose a Vehicular Adhoc Network (VANET)-based Software-Defined Edge Computing infrastructure supporting content delivery services among connected vehicles. The proposed framework relies on the integration of mobile edge computing abilities within the network base stations to achieve promptly communication of V2I interfaces. The authors propose a vehicle-level caching technique to improve V2V communications. The proposed framework which is an extension of Mininet-WiFi is evaluated by comparing content delivery service latency at both the core cloud and the edge of the network.

We conclude our editorial by the article entitled “Collision Avoidance Scheme for Autonomous Vehicles Inspired by Human Social Norms” by Faizal et al. in which the authors introduce a human social norms and human emotions concept to improve the collision avoidance of Autonomous Vehicles (AVs). The concept is based on an artificial society of AVs that have different personalities and different social norms that are coded into their autopilot systems in order to act like well-behaved drivers. NetLogo, which is the standard agent modelling tool Netlogo is used to simulate the artificial society of AVs.

In the end, we would like to acknowledge all the support and efforts from editorial staff in general, and the Editor-in-Chief in particular.

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